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General Comment

See attached file(s)

Attachments

UT DRC Comments Draft CAE BTP Rev1 2012May

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Add = J. Kennedy (JEK1)

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October 8, 2012

Cindy Bladey
Rules, Announcements, and Directives Branch (RADB)
Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001

Re: Utah Division of Radiation Control Comments on the May, 2012 NRC Draft Branch Technical Position (BTP) on LLRW Concentration Averaging and Encapsulation, Revision 1
Docket ID NRC-2011-0022.

Dear Ms. Bladey:

We appreciate the opportunity to provide the attached comments on the above referenced document. We acknowledge the consideration extended to Agreement States as well as to all interested stakeholders by the U.S. Nuclear Regulatory Commission (NRC) throughout the development of the proposed revisions to such a significant document. We look forward to continued collaborative work with the NRC staff regarding the regulation and management of low-level radioactive waste.

Additionally, as a member of the Low-Level Radioactive Waste Forum (LLW Forum) Disused Sources Working Group (Working Group), we have also worked jointly to provide comments on this important document. These comments were submitted separately by the Working Group on behalf of the LLW Forum.

If you have questions, please contact myself at 801-536-4257 (rlundberg@utah.gov), or Loren Morton of my staff at 801-536-4262 (lmorton@utah.gov).

Sincerely,

Rusty Lundberg

Rusty Lundberg
Director

RL/LBM:lm

Enclosure

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UT Comments 5-12 CAE BTP Cover Ltr.docx
File: NRC May, 2012 Draft CAE BTP, Rev. 1

Utah Division of Radiation Control
Comments on the
Draft Branch Technical Position on Concentration Averaging and Encapsulation
Revision 1 – May, 2012
U.S. Nuclear Regulatory Commission (NRC)
October 5, 2012

GENERAL COMMENTS

We acknowledge and appreciate the work of the NRC staff in its consideration and response to incorporate feedback and comments previously offered regarding revisions to the BTP on Concentration Averaging and Encapsulation (BTP). We also express appreciation for NRC's commitment and efforts to involve the public and interested stakeholders, particularly Agreement States, throughout the development of the proposed revisions to the BTP. We especially note the many improvements in the format and content of this revision to the BTP and recognize that such improvements stem from and are directly related to the many hours and significant effort expended by NRC staff in preparing the revised BTP.

SPECIFIC COMMENTS

1. Added Definition Needed to Mixable Wastes, Section 4.1 (p. 9) and Figure 3 (p. 13) – we agree that "mixable" wastes are not necessarily homogeneous. To encourage that they are, the BTP could be modified to set a criteria or ratio for average (or maximum) waste particle size to container volume. When individual waste pieces or particles are large relative to the size of the container, there is less ability to homogenize the container contents. For example, a criterion could be specified that the maximum waste particle size in the package must be 10-times less than the container volume.

2. Mixable Wastes and Waste Homogeneity, Section 4.2.1 (p. 15) – this section suggests that DAW should be considered a homogenous waste because it is "*... expected to degrade within approximately 100 years to a more well mixed and soil like state.*" This assumption may not be supported by technical information, for the following reasons:

   A. High Variability in Physical Materials in DAW: Need for Formal NRC Definition – DAW is an informal term used in the nuclear industry and is subject to various meanings depending on your point of view. As described by the IAEA (p.5) DAW consists of "*...dry active waste (i.e., miscellaneous trash, organic and inorganic rubble) are comprised of cellulosic materials (paper, rags, clothing and wood), rubber gloves and boots, plastics, steel and building debris ...*". Other descriptions for DAW have been provided by NRC, the U.S. Government Accounting Office (GAO), which deserve consideration, and show a large degree of generalization and subjectivity, see Table 1, below. From this comparison, a wide range of physical materials can be considered DAW. For purposes of applying the BTP with respect to what constitutes a homogeneous form of DAW, NRC should provide or explicitly recognize a more consistent description of the types, ranges of characteristics, and examples of materials found in DAW waste as part of the BTP.

B. Comparison of DAW Composition – in a very general way, the physical materials in DAW may be partially comparable to many components of municipal solid waste (MSW), in that a significant portion of MSW is composed of paper and plastic, see Table 1, below. Certainly, the yard trimmings and food scraps content of MSW, which constitute about 27% (by weight, see Table 1, below), is an exception. It is important to note that these two organic exceptions are the most biodegradable of MSW materials, and that one-third to one-half of these vulnerable organics are visually recognizable in municipal landfill excavation studies even after two decades of burial.[1] Given that much of the DAW components are even less degradable, i.e., paper, plastic, clothing, masonry, concrete, and metals – perhaps additional consideration could be given to the physical nature of these materials to have a higher longevity as recognizable materials in a disposal embankment. The NRC statement that DAW is homogeneous because it will degrade in 100-years and be more "soil-like" appears to be based on the assumption that the majority of DAW is degradable within that timeframe, which may not be the case, given the published research regarding similar materials in MSW. See the discussion on paper waste in MSW landfills below. Plastics, wood, concrete and metals will likely be even more recalcitrant to degradation.

As described by the IAEA, DAW can also contain building debris (wood, masonry, metals, and concrete). Under these conditions, DAW materials may be more comparable to non-hazardous construction and demolition waste (CDW); which is strongly dominated by these materials (87 wt. %), see Table 1, below. For these reasons, a more consistent description of the physical characteristics and types of waste in DAW may be necessary with respect to the potential variability in its degradation in a disposal embankment.

[1] Rathje and Murphy, p. 115.

Table 1. Comparison of Physical Materials in DAW, MSW, and CDW

DAW Descriptions			EPA Descriptions: MSW and CDW			
IAEA [2]	NRC	US GAO [3]	2010 MSW [4]		CDW [5]	
DAW	Nuclear Power Plant D&D DAW [6]	DAW (Class B & C)		Wt. %	Industrial / commercial	Wt. %
Miscellaneous trash	Solid laboratory wastes	Glassware or labware	Other (miscellaneous) Glass	3.4 4.6	Landfill debris	9
Organic / inorganic rubble		Charcoal Incinerator ash Soil				
Cellulosic materials (paper, rags clothing and wood)	Air filters Cleaning rags Protective tape Paper coverings Discarded clothing	Compactible trash [7]	Paper Wood	28.5 6.4	Wood	16
Rubber gloves and boots			Rubber, leather and textiles	8.4	n/a	
Plastics	Plastic coverings		Plastics	12.4	n/a	
Steel	Tools Equipment parts		Metals	9.0	Scrap iron	5
Building debris		Demolition rubble Non-compactible trash [8]	n/a [9]		Asphalt Concrete Brick Roofing	2 66 1 1
			Yard trimmings	13.4	n/a	
			Food scraps	13.9	n/a	
			Total:	100.0		100

2 See IAEA, p. 5.

3 See US GAO, Appendix V, Table 9, p. 75.

4 EPA 2011, p. 4. Percentages listed are in mass units for the calendar year 2010.

5 EPA 1998, p. 2-18, Figure 9, based on sample composition of 19 non-residential (industrial / commercial) projects in Pacific Northwest.

6 NRC Draft NUREG-1437, Supplement 17, pp. 2-15 thru 2-16.

7 Compactible trash, as used in the GAO reference, is a very general term and could be described as light density materials (< 62.4 lb/t3) with high internal void ratio. Under this assumption, compactible trash could also include cellulosic materials, rubber gloves, boots, and plastics (as described by the IAEA).

8 Non-compactible trash, as used in the GAO reference, is also a very general term, and could include higher density materials (> 62.4 lb/ft3) with no or little internal porosity; i.e., steel, concrete,

9 Some municipal landfills do co-dispose CDW, but for purposes of this discussion are ignored here.

C. Factors Needed for Biodegradation – multiple waste characteristics and environmental factors need to be present in a disposal embankment for paper / wood products to biodegrade. Some of these include: presence of oxygen (partly controlled by depth of burial), waste particle size (shredding or lack thereof), waste moisture content, waste pH, and waste temperature [10] Of these 5 factors, 2 are most important, waste moisture content and pH [11] It is for these reasons, that many solid waste professionals accept that significant waste biodegradation is accomplished in MSW landfills only after conversion to bioreactors by installation and operation of injection and extraction wells, and constant motion of water / leachates (ibid.). In contrast, at LLRW embankments it is common that limited oxygen is present in the waste form after burial, no or little control of waste particle size during packaging, or placement in the embankment, and limited waste moisture content after burial to support biologic processes (see discussion below).

D. Causal Evidence Between Paper Biodegradation and High Waste Moisture Content – studies on MSW landfills have shed evidence on the longevity of paper wastes after burial. As part of The Garbage Project at the University of Arizona, post burial excavations and waste sampling / analysis was performed at 22 different MSW landfills across the U.S. and Canada between 1987 and 1998 [12]. In this study, the authors found that in cases where the waste form was driest, that paper was more likely to resist biodegradation [13].

   On the other hand, the landfill that demonstrated the greatest degree of paper biodegradation, the Fresh Kills landfill on Staten Island in New York City, experienced significant biodegradation where the waste form had a high water content [14]. In this landfill, initially constructed in 1948, the paper content of the waste decreased from about 41 to 14 % (by weight) after several years of burial, due to biodegradation [15]. In another publication, authors associated with the study described several reasons why this was possible at the Fresh Kills site: 1) the landfill was located in a tidal swamp, 2) constructed without any liner, 3) during operations experienced capillary action to wet and saturate the waste (at significant elevation above water table), and 4) the waste was resupplied daily with fresh water (and dissolved oxygen) by tidal influences [16].

E. Contrasting NRC Embankment Design Requirements - in contrast, LLRW disposal cells by design are required:

   1) Not to be constructed in or near surface water,

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10 Ibid. p. 117.

11 Barlaz, 2004, p. 24.

12 Vitae of The Garbage Project available at: http://traumwerk.stanford.edu:3455/GarbologyOnline/48.

13 Rathje, et.al. 1992, "The Archeology of Contemporary Landfills", see Figure 3.

14 Suflita, et.al., Figure 2, p. 1490.

15 Rathje and Murphy, pp. 119. Some shreds of paper recovered in the excavation process bore the date of July 7, 1949.

16 Ibid, pp. 117 – 122.

2) Located at a significant elevation above groundwater, so as to avoid waste saturation, capillary interactions, and formation of waste leachates,

3) Constructed with low permeability cover layers in order to divert infiltrating water away from the waste, and minimize generation of waste leachates,

4) Isolated from the atmosphere with a clay radon barrier and significant thickness of cover materials; thereby reducing the availability of oxygen to support biologic degradation processes in the waste form [17],

F. Desert Locations for New LLRW Disposal Sites - based on the MSW landfill research, and the more recent locations chosen for U.S. LLRW disposal, it seems unlikely that significant biodegradation of paper wastes in DAW will occur in the Utah and Texas embankments. Even less so, if paper wastes have undergone super-compaction before waste packaging, transport, and disposal.

Given that DAW is an informal term in the industry, and constitutes a wide variety of physical materials, it is possible that degradability within 100-years is uncertain, in light of recent research performed on MSW landfills in North America. Given that wood, plastics, concrete, or metals in DAW are expected to be more recalcitrant than paper, it may be that longer periods of time are needed in order to arrive at "soil-like" conditions. This may need to be considered in the NRC's concepts of waste homogeneity in the BTP. Perhaps more emphasis needs to be placed on waste particle material composition, size, distribution, treatment (stability) and packaging.

This concern may be less important for Class B and C waste, where intrusion protection is mandated for 300 years or more. This longer period of time may provide for sufficient degradation of paper and plastic wastes. It is also possible that even longer intervals will be required for wood, masonry, concrete, and metals.

3. Threshold for Demonstrating Waste Homogeneity, Section 4.2.2.1 (p. 17) – the first paragraph on this page describes criteria deciding if the homogeneity test needs to be performed, as it relates to its sum of fractions. For clarity, adding an equation here to illustrate the requirement would be helpful.

4. Definition of DAW, Appendix A (p. 36) – as described above, NRC could provide a more consistent description of DAW and provide detailed examples of the types of physical materials that constitute this waste form. This is critical in that the BTP concepts of homogeneity are dependent on some waste forms degrading to "soil-like" material in 100 years or less.

5. Mixable Waste Definition, Appendix A (p. 36) –include consideration of waste particle size relative to container volume, see discussion above.

6. Increase in Sealed Source Activity (now Section 4.3.2, Table A) – consider adding text to clearly state that Agreement States are not required to adopt the changes made in the table,

[17] Ibid., p. 117. Significant oxygen is generally available for aerobic bacteria at depths of 8 feet or less in a MSW landfill.

which increased the Class A activity limit, above which a sealed source has to be considered an individual item for disposal.

7. Use of Disposal Site Waste Acceptance Criteria (now in Section 4.10, p. 33) –the use of individual site-specific waste acceptance criteria (WAC) on the part of generators to package/classify their waste is of particular interest or concern for sited states for at least three reasons:

   A. Generic Assumptions Behind LLRW Classification System – the original NRC rules (early 1980's) for LLRW classification already took into account general assumptions for inadvertent intruder protection. Individual site-specific WAC may require LLRW generators to be more aware of and fully understand a given disposal site's individual WAC requirements for purposes of waste packaging and classification. This potentially creates more opportunity for generators, waste processors, and brokers to make mistakes in waste packaging/classification in order to comply with a disposal site's unique WAC.

   B. Added Burden on Host States – the proposed change places more burden on host States to verify waste classification after arrival at the disposal sites.

      To assist the host States, we recommend NRC add new criteria to both the common and non-common performance indicators in its IMPEP program. For example, common performance indicators are important in this effort, in that radiation control programs / Agreement States have the responsibility to oversee and approve decommissioning projects, which inherently generate waste; some of which is LLRW. The purpose of adding these performance indicators to the IMPEP review process is to enhance regulatory oversight of LLRW generators, waste processors, treatment facilities, and brokers in meeting applicable WAC requirements, as determined by sited states.

   C. Need to Preserve the Existing Classification System – the new dependence of generators on individual disposal-site WACs to package and classify waste, must not supersede or replace the existing LLRW classification system in 10 CFR Part 61.

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